

U.S. DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE		DATE: <b>April 3, 2001</b>
<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>		U.S. APPLN. NO. (if known): <b>09/821451</b>
INTERNATIONAL APPLICATION NO.: <b>PCT/JP99/05430</b>	INTERNATIONAL FILING DATE: <b>OCTOBER 1, 1999</b>	PRIORITY DATE CLAIMED: <b>OCTOBER 6, 1998</b>
TITLE OF INVENTION: <b>DRUG SYRINGE</b>		
APPLICANT(S) FOR DO/EO/US: <b>Toshikazu HIRAYAMA, Shuji HASEGAWA, Toshio TOCHIYAMA, Tooru EGUCHI, Yasumitsu SHIMIZU and Junko YONEDA</b>		
Applicant hereby submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<p>1. <u>XX</u> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <u>   </u> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <u>XX</u> This express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the time limit set in 35 USC 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <u>XX</u> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <u>XX</u> A copy of the International Application as filed (35 U.S.C. 371(c)(2)):</p> <p style="margin-left: 40px;">a. <u>   </u> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 40px;">b. <u>XX</u> has been transmitted by the International Bureau.</p> <p style="margin-left: 40px;">c. <u>   </u> is not required, as the application was filed in the United States Receiving Office (RO/US)</p> <p>6. <u>XX</u> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</p> <p>7. <u>XX</u> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p style="margin-left: 40px;">a. <u>   </u> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p style="margin-left: 40px;">b. <u>   </u> have been transmitted by the International Bureau.</p> <p style="margin-left: 40px;">c. <u>   </u> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p style="margin-left: 40px;">d. <u>XX</u> have not been made and will not be made.</p> <p>8. <u>   </u> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <u>XX</u> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <u>   </u> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p><b>ITEMS 11. TO 16. BELOW CONCERN OTHER DOCUMENT(S) OR INFORMATION INCLUDED:</b></p> <p>11. <u>XX</u> An Information Disclosure Statement under 37 CFR 1.97 and 1.98 together with the international search report and 3 references.</p> <p>12. <u>XX</u> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. ASSIGNEES NAMES AND ADDRESSES: (1) <b>NISSHO CORPORATION, Osaka-shi, Japan; and</b> (2) <b>SUNSTAR INC., Takatsuki-shi, Japan</b></p> <p>13. <u>   </u> A <b>FIRST</b> preliminary amendment. <u>   </u> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment</p> <p>14. <u>   </u> A substitute specification.</p> <p>15. <u>   </u> A change of power of attorney and/or address letter.</p> <p>16. <u>XX</u> Other items or information: 2 sheets of drawings.</p>		

U.S. APPLICATION NO. (if known) <b>09/821451</b>	INTERNATIONAL APPLICATION NO. <b>PCT/JP99/05430</b>	DATE: <b>April 3, 2001</b>
---	--	----------------------------

17. <input checked="" type="checkbox"/> The following fees are submitted:  <b>Basic National Fee (37 CFR 1.492(a)(1)-(5):</b> Search Report has been prepared by the EPO or JPO: ..... \$860.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$690.00  No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$710.00  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1000.00  International preliminary examination fee (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$100.00  <div style="text-align: right;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 860.00</b></div>	CALCULATIONS	PTO USE ONLY
---	--------------	--------------

Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than __ 20 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		
--	--	--

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
TOTAL	6 - 20 =		X \$ 18.00		
INDEPENDENT	2 - 3 =		X \$ 80.00		
Multiple dependent claims(s) (if applicable)			+ \$270.00		
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$ 860.00</b>	
Reduction by 1/2 for filing by small entity, if applicable. (Note 37 CFR 1.9, 1.27, 1.28).					
<b>SUBTOTAL =</b>				<b>\$ 860.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than __ 20 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +					
<b>TOTAL NATIONAL FEE =</b>				<b>\$ 860.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00 per property +</b>				<b>\$ 40.00</b>	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$ 900.00</b>	
				Amount to be:	
				refunded	\$ _____
				charged	\$ _____

ATTORNEY'S DOCKET NO: 010477

U.S. APPLICATION NO. (if known) <b>09/821451</b>	INTERNATIONAL APPLICATION NO. <b>PCT/JP99/05430</b>	DATE: <b>April 3, 2001</b>
--	--	----------------------------


a. ☒ A check in the amount of \$ **900.00** to cover the above fees is enclosed. (\$860.00 for filing fee and \$40.00 for assignment recordation fee). (This paper is filed in triplicate)


b. ☐ Please charge my Deposit Account No. 01-2340 in the amount of \$  to cover the above fees. (A duplicate copy of this sheet is enclosed.)

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 01-2340.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed to request that the application be restored to pending status.

**Send All Correspondence To:**

  
**23850**  
 PATENT TRADEMARK OFFICE

  
 SIGNATURE  
**William G. Kratz, Jr.**  
 NAME  
**22,631**  
 REGISTRATION NUMBER

WGK/yap

ARMSTRONG, WESTERMAN, HATTORI,  
 McLELAND & NAUGHTON, LLP  
 Suite 1000, 1725 K Street, N.W.  
 Washington, D. C. 20006  
 Tel: (202) 659-2930  
 Fax: (202) 887-0357

DESCRIPTIONDRUG SYRINGE

5

Field of the Invention

The present invention relates to a drug syringe, and more particularly, to a drug syringe for a local administration in medical field and the like, the tip of which is detachable and does not fall off even under high pressure.

10

Background of the Invention

As a local administration syringe utilized in medical field, conventionally, cartridge-mounted and injector-type syringe have been known. The cartridge-mounted syringe is most often used when administering a local anesthetic drug, primarily, in the field of dentistry. The injector-type syringe is used as a disposable one which gives serious consideration to the aspect of hygiene, and is utilized as a bioadhesive filled container at a surgical operation in the medical field, and a drug-filled container for treating periodontal disease is known in dental field. With regard to a periodontal disease remedy, syringes for injecting a drug into a periodontal pocket to remove periodontopathic bacteria that propagate inside the periodontal pocket have been proposed in Japanese Patent Application Laid open No. 4-117959 or Japanese Patent Utility Model Registration No.3035448. The syringe disclosed in

Japanese Patent Application Laid-open No. 4-117959 is a syringe on which a mark for decision is disposed at a position on the nozzle separated from the distal end position by a distance corresponding to the depth of a periodontal pocket, which constitutes the criteria for determining whether or not a drug is injected. The nozzle is disposed by being inclined at a predetermined angle relative to the axis at the distal end portion of the syringe body, and when used, the syringe nozzle is inserted into a periodontal pocket, and a determination to inject a drug or not is made by observing an appearance of the mark from the periodontal pocket and the disappearance and when injection is required, a plunger is depressed in the as-is state, and the drug can be injected from the nozzle.

However, although the regions to which a syringe is applied are numerous and varied, it was not possible to change the size of the nozzle in accordance with the state of the injection region (depth, shape etc. of the pocket) with the syringe disclosed in the above-mentioned Japanese Patent Application Laid-open No. 4-117959 wherein the nozzle and syringe body are integrally formed. Further, the drug loaded completely inside a syringe is seldom used up in one usage and the syringe must be discarded from the standpoint of preventing infections such as the AIDS and hepatitis in recent years even though ample drug remains, so that there was the drawback that it is uneconomical.

Accordingly, as a syringe in order to resolve the

drawbacks of the above-mentioned drug syringe, a syringe which is provided with a nozzle mounting portion inclined at a predetermined angle on the top of a syringe body, and is capable of mounting a plurality of nozzles of different diameters and/or lengths is proposed (Japanese Utility Model Registration No.3035448). However, this syringe engages a nozzle in a tapered condition to a nozzle mounting portion which is formed in a tapered shape, and there is a danger that the nozzle falls off from the nozzle mounting portion during use when a substance of a high viscosity is injected. Further, because the inclination angle of the nozzle to the syringe body is established, it is actually impossible to change the angle without replacing the syringe main body when it is desirable to change the angle in accordance with the injection region.

#### SUMMARY OF THE INVENTION

With the foregoing in view, it is an object of the present invention to provide a drug syringe which is capable of using a nozzle of an appropriate size and angle in accordance with an injection region, and which can prevent infection and make economical use of drugs by replacing a nozzle.

The present inventors, as a result of zealous studies to solve the above-mentioned problems, arrived at the idea of using a nozzle, a distal end of which is inclined at a predetermined angle relative to a proximal end, and accomplished the invention. That is, the present invention

is a drug syringe comprising a barrel which is provided with a nozzle mounting portion at a distal end thereof; a plunger which is provided with a gasket capable of hermetically sliding along the inner wall of said barrel at a distal end thereof and is inserted from a proximal end of said barrel; and a nozzle which is freely detachable from said nozzle mounting portion, wherein said nozzle includes a mounting portion of the proximal end provided with means for mounting to said nozzle mounting portion and a discharging portion which extends bending at a predetermined angle from this mounting portion.

It is desirable that the mounting portions of the nozzle and the nozzle mounting portion of the barrel are formed so as to enable a luer lock. More specifically, the nozzle mounting portion is constituted with a distal end tip that engages with the inner cavity of the nozzle and female threads that are disposed concentrically on the outside of the distal end tip, and these female threads screw together with male threads disposed on the proximal end of the nozzle. The female threads can be integrally formed with the barrel, or can be disposed in a freely rotating condition on the outer wall of the barrel. Furthermore, the nozzle which includes a proximal end side mounting portion provided with means for mounting to the tip of the barrel and a discharging portion which extends bending at a predetermined angle from this mounting portion, can also be applied to an ordinary injector.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal cross-sectional view showing one embodiment of the present invention; and

Fig. 2 is a longitudinal cross-sectional view showing  
5 another embodiment of the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Next, the embodiments of the present invention will be explained by referring to the figures.

10 Fig. 1 is a longitudinal cross-sectional view showing one embodiment of the present invention, and Fig. 2 is a longitudinal cross-sectional view showing another embodiment.

A drug syringe of the present invention comprises a barrel 1 which is provided with a nozzle mounting portion 11  
15 at a distal end thereof; a plunger 2 which is provided with a gasket 21 at a distal end thereof; and a nozzle 3 which is freely detachable with the nozzle mounting portion 11, wherein the nozzle 3 includes a mounting portion 31 for mounting to the barrel 1 and a discharging portion 32 which extends bending  
20 at a predetermined angle from this mounting portion 31.

The barrel 1 is a tubular container which is formed from a synthetic resin such as polypropylene, polyethylene, or cyclic polyolefin and has a flange 12 at the proximal end to be pushed by finger at an injection operation and is provided  
25 with the nozzle mounting portion 11 for mounting a nozzle 3 at the distal end. The nozzle mounting portion 11 ordinarily



comprises a distal end tip 111 which is mounted and engaged with an inner cavity 312 of the mounting portion 31 of the nozzle 3 and female threads 112 which screw together with the hereinbelow-described male threads 311 disposed at the proximal end of the nozzle 3. The female threads 112 are a hood-shaped member concentrically disposed on the outside of the distal end tip 111, and as shown in Fig. 1, can be integrally formed with a barrel 1, or, as shown in Fig. 2, can also be disposed in a freely turning condition on the outer wall of the barrel 1, and is constituted so as to make the orientation of a nozzle 3 changeable at will. Furthermore, the distal end tip 111 is ordinarily disposed so as to protrude toward the distal end side away from the female threads 112, as shown in Fig. 1 and Fig. 2.

The plunger 2 is a discharging member which is provided with a gasket 21 at the distal end of the plunger rod 22 and is inserted from the proximal end of the barrel 1. The plunger rod 22 is a rod-shaped member formed from a synthetic resin such as polypropylene, polyethylene, polycarbonate, polystyrene or ABS and has a head 221 at the distal end. The gasket 21 is a closing member typically formed from an elastic rubber material such as butyl rubber or isoprene rubber, is mounted to the head 221 of the plunger rod 22 and is capable of sliding hermetically along the inner wall of the barrel 2 which has been inserted.

The nozzle 3 is a hollow member formed from the same

synthetic resin as the barrel 1 and includes a mounting portion 31 which is provided with means for mounting to the nozzle mounting portion 11 of the barrel 1, and a discharging portion 32 which extends bending at a predetermined angle from this mounting portion 31. Means for mounting to the nozzle mounting portion 11 is disposed at the proximal end of the mounting portion 31 and male threads 311 which are coupling means corresponding to the female threads 112 of the barrel 1 are ordinarily utilized. The male threads 311 are ordinarily disposed axisymmetrically in a double threaded condition (referred to as a double threaded screw), and are capable of being screwed together with the female threads 112 of the barrel 1. The discharging portion 32 is a part which extends toward the distal end by being bent at a predetermined angle from the mounting portion 31 and is formed so as to become thinner at the tip in a tapered shape. The size and bending angle of the discharging portion 32 are determined in line with the state of an injection region of a patient, and ordinarily the size of the discharging portion 32 is from 3 to 20 mm, and the bending angle is ordinarily from 0° to 90°.

Furthermore, the nozzle 3 can be molded entirely in one step, or in order to improve the dimensional precision of the discharging portion 32, either the whole nozzle can be formed by molding an insert after forming a discharging portion 32, or a mounting portion 31 and a discharging portion 32 can be formed separately, and thereafter bonded together (in this case,

the mounting portion 31 must be bent at a predetermined angle at the distal end part thereof). Further, the drug syringe of the present invention can also be provided as a pre-filled syringe in which a drug is previously loaded into the inside  
5 of the barrel 1, and the nozzle mounting portion 11 at the distal end is closed with a cap (not shown in the figures).

As is clear from the above explanation, it is possible to select a nozzle of the appropriate size and bending angle in accordance with the state of the injection region of a  
10 patient at time of use by using the drug syringe of the present invention. Further, because the nozzle can be replaced at time of reuse, it is possible to prevent infection from the nozzle part.

What is claimed is:

1. A drug syringe comprising:

a barrel which is provided with a nozzle mounting  
5 portion at a distal end thereof;

a plunger which is provided with a gasket capable  
of sliding hermetically along an inner wall of the barrel at  
a distal end thereof and inserted from a proximal end of said  
barrel; and

10 a nozzle which is freely detachable with said nozzle  
mounting portion,

wherein said nozzle includes a mounting portion on  
the proximal end side which is provided with means for mounting  
to said nozzle mounting portion and a discharging portion which  
15 extends bending at a predetermined angle from this mounting  
portion.

2. The drug syringe according to claim 1, wherein the  
mounting portion of the nozzle and the nozzle mounting portion  
of the barrel are formed so as to enable a luer lock.

20 3. The drug syringe according to claim 2, wherein the  
nozzle mounting portion comprises a distal end tip that engages  
with the inner cavity of the nozzle and female threads which  
are disposed concentrically on the outside of the distal end  
tip, and said female threads are constituted so as to screw  
25 together with male threads disposed on the proximal end of the  
nozzle.

4. The drug syringe according to claim 3, wherein the female threads are integrally formed with the barrel.

5. The drug syringe according to claim 3, wherein the female threads are disposed in a freely rotatable condition  
5 on the outer wall of the barrel.

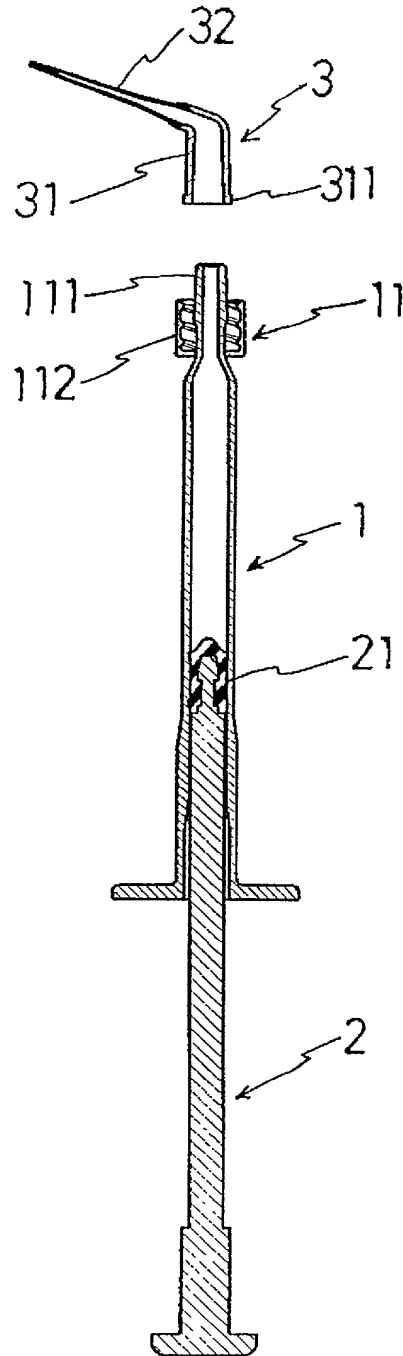
6. A nozzle for a drug syringe comprising:  
a mounting portion on the proximal end side which is provided with means for mounting to a tip of a barrel; and  
a discharging portion which extends bending at a  
10 predetermined angle from this mounting portion.

ABSTRACT OF THE DISCLOSURE

A drug syringe which is capable of applying a nozzle of an appropriate size and angle corresponding to a patient, and can prevent infection and make economical use of drugs by replacing the nozzle is disclosed. The drug syringe comprises a barrel 1 which is provided with a nozzle mounting portion 11 at a distal end thereof; a plunger 2 which is provided with a gasket 21 at a distal end thereof; and a nozzle 3 which is freely detachable from the nozzle mounting portion 11, wherein the nozzle 3 includes a mounting portion 31 to the barrel 1, and a discharging portion 32 which extends bending at a predetermined angle from the mounting portion 31.



Fig. 2





**Declaration For U.S. Patent Application**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Drug Syringe

The specification of which is attached hereto unless the following is checked:



was filed on October 1, 1999 as United States Application Number or PCT International Application Number PCT/JP99/05430 and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a) – (d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

		Priority Claimed	
<u>H10(1998)-283909</u>	<u>Japan</u>	<u>06/10/98</u>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Day/Month/Year Filed)	
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Day/Month/Year Filed)	
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Day/Month/Year Filed)	
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Day/Month/Year Filed)	

☐ See attached list for additional prior foreign applications.

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below

_____	_____
(Application Number)	(Filing Date)
_____	_____
(Application Number)	(Filing Date)

I hereby claim that the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

(List Prior U.S. Applications)	_____	_____	_____
	(Application Serial Number)	(Filing Date)	(Status) (patented, pending, abandoned)
	_____	_____	_____
	(Application Serial Number)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

James E. Armstrong, III, Reg. No. 18,366; William F. Westerman, Reg. No. 29,988; Ken-Ichi Hattori, Reg. No. 32,861; Le-Nhung McLeland, Reg. No. 31,541; Ronald F. Naughton, Reg. No. 24,616; John R. Pegan, Reg. No. 18,069; William G. Kratz, Jr., Reg. No. 22,631; Albert Tockman, Reg. No. 19,722; Mel R. Quintos, Reg. No. 31,898; Donald W. Hanson, Reg. No. 27,133; Stephen G. Adrian, Reg. No. 32,878; William L. Brooks, Reg. No. 34,129; John F. Carney, Reg. No. 20,276; Edward F. Welsh, Reg. No. 22,455; Patrick D. Muir, Reg. No. 37,403; Gay A. Spahn, Reg. No. 34,978; and John P. Kong, Reg. No. 40,054.

Cont'd.--

Please direct all communications to the following address:

ARMSTRONG WESTERMAN, HATTORI

McLELAND & NAUGHTON

1725 K Street, N.W. Suite 1000

Washington, D.C. 20006

TEL.: (202) 659-2930 FAX: (202) 887-0357

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18 of the United States Code, § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor (given name, family name) Toshikazu HIRAYAMA

Inventor's signature Toshikazu Hirayama Date March 29, 2001

Residence Osaka-shi, Osaka, Japan Citizenship JAPAN

Post Office Address c/o NISSHO CORPORATION 9-3, Honjonishi 3-chome, Kita-ku, Osaka-shi, Osaka 531-0073 Japan

Full name of sole or second inventor (given name, family name) Shuji HASEGAWA

Inventor's signature Shuji Hasegawa Date March 29, 2001

Residence Osaka-shi, Osaka, Japan Citizenship JAPAN

Post Office Address c/o NISSHO CORPORATION 9-3, Honjonishi 3-chome, Kita-ku, Osaka-shi, Osaka 531-0073 Japan

Full name of sole or third inventor (given name, family name) Toshio TOCHIYAMA

Inventor's signature Toshio Tochiyama Date March 29, 2001

Residence Osaka-shi, Osaka, Japan Citizenship JAPAN

Post Office Address c/o NISSHO CORPORATION 9-3, Honjonishi 3-chome, Kita-ku, Osaka-shi, Osaka 531-0073 Japan

Full name of sole or fourth inventor (given name, family name) Toru EGUCHI

Inventor's signature Toru Eguchi Date March 29, 2001

Residence Takatsuki-shi, Osaka, Japan Citizenship JAPAN

Post Office Address 10-1-208, Kamihamuro 1-chome, Takatsuki-shi, Osaka 569-1044 Japan

Full name of sole or fifth inventor (given name, family name) Yasumitsu SHIMIZU

Inventor's signature Yasumitsu Shimizu Date March 29, 2001

Residence Kusatsu-shi, Shiga, Japan Citizenship JAPAN

Post Office Address 10-20-1106, Hirai 5-chome, Kusatsu-shi, Shiga 525-0023 Japan

Full name of sole or sixth inventor (given name, family name) Junko YONEDA

Inventor's signature Junko Yoneda Date March 29, 2001

Residence Ibaraki-shi, Osaka, Japan JAX Citizenship JAPAN

Post Office Address 26-77, Yamatedai 3-chome, Ibaraki-shi, Osaka 567-0009 Japan

Full name of sole or seventh inventor (given name, family name) \_\_\_\_\_

Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_

Residence \_\_\_\_\_ Citizenship \_\_\_\_\_

Post Office Address \_\_\_\_\_

Full name of sole or eighth inventor (given name, family name) \_\_\_\_\_

Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_

Residence \_\_\_\_\_ Citizenship \_\_\_\_\_

Post Office Address \_\_\_\_\_